METHOD OF IMAGE
DITHERING PROCESS FOR
DETECTING PHOTO AND
CHARACTER AUTOMATICALLY

DESCRIPTION

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention generally relates to a method of automatically detecting images and text, and then process the images and text separately, especially relates to increase the clarity of both monochrome and color documents when faxing or copying them.

Background Description

Nowadays, when people deal with the copying and faxing of color documents (or gray-scale documents), in order to raise the clarity of the copies and reduce the distortion of the copies, they have to process the image and text of the master copy separately because of the different characters of images and text.

For example, when a gray scale document is faxed, it is usually transformed to monochrome mode. When being transformed, the content of the document will not be able to present the original clarity and resolution without

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distort if the transformation is not done with halftone processing (halftone, including dithering and diffusion), because the content contains both images and text. Moreover, if all content of the document is half toned, the text will be scattered. As a result, traditionally, the images and text will be processed separately.

However, the current processing method which deals with images and text separately, ignores the problem of low speed in order to keep the genuineness and the quality of the copy or fax. That is, the current images and text detection is implemented by hardware, which processes the original images (smear or blur it) and then separates images and text; it costs more to use hardware to process images and takes more time to detect the images and text because of the extra process. Moreover, the current halftone processing takes more transformation time because there are more sampling points and a larger sampling zone.

SUMMARY OF THE INVENTION

While there is incompetence in the conventional arts stated in the background of invention above, one of the goals of the present invention is to propose a method to separate image and text area, which quickly separate images and text based on the character, of bit depth distribution, in order to reduce the halftone processing zone.

The other goal is to decrease the sampling points of halftone processing in order to reduce the process

time.

Based on the goals above, the present invention offers a halftone processing of images and text auto detection, which includes the following steps: choosing a background color from a master copy, separating the content of the master copy into images and text with the chosen background color as the criterion, processing the images with halftone processing, processing the text with link art processing, and outputting the processed images and processed text as a whole.

In the present invention stated above, the halftone processing is a dithering, and the dithering equation is the sampling mode in the figure 5 (mark 50) times one sixty-eighth.

In the present invention stated above, a preferred embodiment comprises choosing a first background color from a master copy, separating the content of the master copy into images and text with the first background color as the criterion, condensing the master copy based on the first background color, cutting transversely the condensed master copy based on the first background color, cutting vertically the transversely cut master copy based on the first background color; thus, there will be several individual areas, choosing a second background color from the individual areas, identifying images and text based on the second background color, marking the individual areas with images as an image area, marking the individual areas with text as a text area, if the individual areas cannot be identified, replacing the first background

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color with the second background color, condensing the unidentifiable individual areas based on the second background color, and then repeating the steps above, processing the images with halftone processing, processing the text with link art processing, and outputting the processed images and processed text as a whole.

BRIEF DESCRIPTION OF THE DRAWINGS

The foregoing and other objects, aspects and advantages will be better understood from the following detailed description of a preferred embodiment of the invention with reference to the drawings, in which:

Figure 1 shows a prior known flatbed scanner;

Figure 2 is a three-dimension scheme diagram of the present invention;

Figure 3 is a cross-section diagram of the present invention;

Figure 4 is an assembly diagram of the present invention;

Figure 5 shows the placement of the present invention.

Figure 1 is an illustration of the present invention;

Figure 2 shows the method and detailed steps of the automatically detecting image and text;

Figure 3 shows the images and text processed respectively;

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Figure 4 is an embodiment of the condensing process to the master copy of the present invention; and

Figure 5 shows the equation and sampling mode of the dithering in the present invention.

DETAILED DESCRIPTION OF A PREFERRED EMBODIMENT OF THE INVENTION

The following is a detailed description of the present invention. However, other than the detailed description, the present can also be widely implemented in other embodiment, and the scope of the present invention is not limited and is based on the future patent scope.

Moreover, to provide more detailed description and clearer understanding of the present invention, the figures are not drawn according to the corresponding scale. Some measurement and scale have been exaggerated and some unrelated details are not drawn, in order to make the figure concise.

The present invention is illustrated in the figure 1, firstly, detect 11 the image and text areas included in the master copy; secondly, separate images and text 12 (the procedure is illustrated in the figure 2); thirdly, half tone 13 the images (halftone processing, the preferred embodiment takes one of the halftone processing methods, dithering processing, as an example) to obtain the best resolution and process the text with line art processing 15; then combine 14 the processed images and text to fax or copy the master copy with a clear tone

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level gradation of images and text.

One thing to be noted is that there are different
ways of halftone processing, such as dithering, ordered
dithering, error diffusion, and so on. The present
invention takes dithering as an embodiment. In dithering,
which is illustrated in the figure 3, the images and text
are identified in a master copy with both image and text,
and different areas are dithered separately. Thus, when
there is a gray scale in an area (generally, there can
be 0 (darkest) to 255 (brightest)), can present a clear
tone level gradation. Of course, the gray scale can be
divided into 1024 levels; this depends on the demand of
the designer. Then, the text is line art processed, which
means there are only two values (either 0 (darkest) or
255 (brightest)) for text, so the text area can be presented
clearly. Lastly, the processed images and text are
combined, to make the images and text of the finished
copy clear.

The sampling method of the dithering stated above
is illustrated in the figure 5, the dithering equation
is the adjacent pixels times one sixty-eighth the based
on the sampling mode in the figure 5 (mark 50).

The method of detecting and separating images and
text is illustrated in the figure 2, it comprises:
Choosing a background color from images or text areas
which are going to be detected (step 21),
Condensing the master copy based on the first
background color (step 22),
Cutting transversely the condensed area (step 23),

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Cutting vertically the transversely cut area (step 24),

Thus, the original area can be divided into several individual areas (step 25),

5   Choosing a background color from the individual areas (step 26),

Identifying images and text based on the second background color (step 27),

If the individual areas cannot be identified, it
10   is possible that the area contains smaller image and text region.

Therefore, use the chosen background color or choose another background color, back to step 22, and repeat
15   the auto-detection process, Marking the individual areas with images as an image area (step 29), Marking the individual areas with text as a text area (step 28).

In step 23, if the area cannot be transversely cut,
20   jump to step 24 and vertically cut it. If, in step 24, the area cannot be vertically cut, jump to step 26. In special cases, the area may not be transversely cut as step 23, vertically cut as step 24, or identified image or text, mark it as an image area (not shown in the figure
25   2).

The method of automatically detecting images and text is better illustrated in the figure 4. As shown in the figure 4, a master copy area is firstly condensed
30   with the chosen background color, in order to omit the area containing neither image nor text and save the time of halftone processing or line art processing (because

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the more area to be processed, the more time the whole process will take). Then, transversely and vertically cut the condensed area, which will divide the condensed area into several individual areas, and identify whether the individual areas are image areas or text areas with either hardware or software. Lastly, if an individual area cannot be identified whether it is an image or text area, repeat the process of condensing, transversely cutting, and vertically cutting on the individual area.

Although preferred embodiments of the present invention have been described in the forgoing description and illustrated in the accompanying drawings, it will be understood that the invention is not limited to the embodiments disclosed, but is capable of numerous rearrangements, modifications, and substituting of parts and elements without departing from the spirit and scope of the invention. Accordingly, the present invention is intended to encompass such rearrangements, modifications, and substitutions of parts and elements as fall within the scope of the appended claims.